



## A FILE MANAGING METHOD FOR A RECORDED DIGITAL STREAM

### BACKGROUND OF THE INVENTION

#### 1. Field of the Invention

[001] The present invention relates to a file management method of prohibiting copy of a file and change of a file name or a directory of a file which is recorded in a disk recording medium such as a rewritable digital versatile disk (DVD).

#### 2. Description of the Related Art

[002] FIG. 1 shows partial elements of an optical device such as a video disk recorder which recording and reproducing a signal to/from a disk recording medium such as a rewritable DVD. The device configured as FIG. 1 comprises an optical pickup 2 reading a signal recorded on a rewritable DVD 1 or writing a data stream processed into a writable signal on the rewritable DVD 1; a VDR unit 3 processing the read signal to restore to original data and converting an inputted data stream into a signal adequate to be written; and an encoder 4 encoding a received analog signal into a data stream which is sent to the VDR (Video Disk Recording) unit 3.

[003] A disk file management method conducted by the optical device connected with a personal computer through a digital interface is explained referring to the accompanying drawings.

[004] Various types of data files are recorded on the rewritable DVD 1 and the data files consist of data stream files and information files. The data stream files contain text data or real time audio and video

(A/V) data of large size, and the information files contain control information such as navigation data for the A/V or text data contained in the data stream files.

**[005]** To manage recorded files, the rewritable DVD may adopt a fixed file structure, which is adopted for a DVD ROM disk, composed of a root directory, several title set directories located under the root, and data files having different names and extension located under each title set directory.

**[006]** FIG. 2 shows an example of such a fixed file structure in which a video title set directory under a root directory has several data files having different extension names.

**[007]** Under the video title set directory, many files of 'Video\_TS.IFO', 'Video\_TS.VOB', 'Video\_TS.BUP', 'VTS\_01\_0.IFO', 'VTS\_01\_1.VOB', 'VTS\_01\_2.VOB', and 'VTS\_01\_0.BUP' have been recorded. The file 'Video\_TS.IFO' contains video data management information, the file 'Video\_TS.VOB' contains menu data of a recorded video object (VOB), the file 'Video\_TS.BUP' contains backup data for the video data management information, the file 'VTS\_01\_0.IFO' contains information on the first video title set, the file 'VTS\_01\_1.VOB' is the first video object containing A/V data belonging to the first video title set, the file 'VTS\_01\_2.VOB' is the second video object containing A/V data belonging to the first video title set, and the file 'VTS\_01\_0.BUP' contains backup information on the first video title set.

**[008]** In addition, detailed information for each of the above files is written in a file identifier descriptor (FID) whose fields are shown in FIG. 3A. These fields are 'Descriptor Tag', 'File Version

Number', 'File Characteristics', 'Length of File Identifier', 'Information Control Block (ICB)', 'Length of Implementation Use', 'Implementation Use', 'Name of File Identifier', and padding. Among these fields, 'Name of File Identifier' field is used for writing a string indicative of a file name, 'Length of File Identifier' field is used for writing size information of the file name, and 'File Characteristics' field, whose size is 1 byte, is used for writing various attributes of the file. The attributes written in 'File Characteristics' field are shown in FIG. 3B. The first LSB (Least Significant Bit) indicates whether an associated file exists or not, the second LSB indicates whether the file is directory or file, the third indicates deletion of the file, the fourth indicates whether the directory is parent or not, the fifth indicates meta data, and the remaining bits are reserved for future use.

**[009]** If the first title set recorded on the rewritable DVD 1 having the above file structure is requested to be reproduced after the rewritable DVD 1 is inserted in the optical disk device of FIG. 1, the VDR unit 3 searches the DVD 1 for video title set directory under the root directory, and tries to read the several files under the video title set directory. To read data files and their management file belonging to the first video title set requested to be reproduced, the VDR unit 3 refers to information written in FID. The VDR unit 3 reads data files sequentially after searching them using navigation information written in the management file.

**[010]** The disk device of FIG. 1 may be connected to a personal computer (PC) through a digital interface, so that a user might request a file name of the rewritable DVD 1 to be changed into a desirable name through the PC

and the digital interface. In addition, a user might move files under a video title set directory to other directory.

**[011]** Such changes of file name and directory might be directly conducted on the PC after the rewritable DVD 1 is placed in the PC.

**[012]** However, the VDR unit 3 searches a rewritable DVD for pre-specified file names under pre-specified directory according to a playback-requested video title set. Therefore, the VDR unit 3 could not determine which file to read so that it could not reproduce a playback-requested video title set, if the file or directory names were changed or files were moved to other directories.

**[013]** Besides these problems, there is a problem that video title sets recorded on a rewritable DVD may be copied onto other storage device through a PC, which would cause to infringe a copyright of the video title sets.

#### **SUMMARY OF THE INVENTION**

**[014]** It is an object of the present invention to provide a file management method for a recorded digital stream which is able to prevent file name and directory of a rewritable disk recording medium from being changed as well as to prevent files recorded on the rewritable disk recording medium from being copied onto other storage device with a PC.

**[015]** A file management method for a recorded digital stream according to an aspect of the present invention writes, in a writable disk, file describing information comprising file attributes for informing whether to

prohibit renaming of file, directory change, or file copy, and determines whether to conduct a requested renaming of file, directory change, or file copy based on the written file attributes contained in the file describing information.

[016] These and other objects of the present application will become more readily apparent from the detailed description given hereinafter. However, it should be understood that the detailed description and specific examples, while indicating preferred embodiments of the invention, are given by way of illustration only, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from this detailed description.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

[017] The accompanying drawings, which are included to provide a further understanding of the invention, illustrate the preferred embodiments of the invention, and together with the description, serve to explain the principles of the present invention.

[018] In the drawings:

[019] FIG. 1 shows partial elements of an optical device such as a video disk recorder which recording and reproducing a signal to/from a disk recording medium such as a rewritable DVD;

[020] FIG. 2 is an example of a fixed file structure;

[021] FIGS. 3A and 3B show a format of file identifier descriptor and its attribute field, respectively;

[022] FIG. 4 shows examples of attribute bit flags

according to the present invention; and

[023] FIGS. 5A and 5B are flow diagrams of a file management method for a recorded digital stream according to the present invention.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[024] In order that the invention may be fully understood, preferred embodiments thereof will now be described with reference to the accompanying drawings.

[025] The file identifier descriptor written on a rewritable DVD according to the present invention has the same structure as the conventional file identifier descriptor, except for internal attribute bits of its field 'File Characteristics'. That is, the file identifier descriptor, as shown in FIG. 3A, has fields of 'Descriptor Tag', 'File Version Number', 'File Characteristics', 'Length of File Identifier', 'Information Control Block (ICB)', 'Length of Implementation Use', 'Implementation Use', 'Name of File Identifier', and padding.

[026] The attribute bit flags of the 'File Characteristics' field according to the present invention are shown in FIG. 4. The first LSB ('0' in FIG. 4) indicates whether an associated file exists or not, the second LSB ('1') indicates whether the file is directory or file, the third bit ('2') indicates deletion of the file, the fourth bit ('3') indicates whether the directory is parent or not, the fifth bit ('4') indicates meta data, the sixth bit ('5') indicates whether a file name is changeable or not, the seventh bit ('6') indicates whether a file is movable or not, and the last bit ('7') indicates whether a file is

allowed to be copied or not.

**[027]** As shown in FIG. 4, the 'File Characteristics' field according to the present invention has additional bit flags of 'No Permit to Change Name', 'No Permit to Move File', and 'No Permit to Copy File' besides the conventional attribute bits of 'Existence', 'Directory', 'Deleted', 'Parent', and 'Meta Data'. These three 'No Permit' attribute bit flags are used as information to refer whenever a file is requested to rename, move, or copy or in a PC or from a PC to an optical disk device through a connecting digital bus.

**[028]** The 'No Permit to Change Name' bit flag is used for determining whether to allow to rename an associated file, the 'No Permit to Move File' bit is used for determining whether to allow to change a directory to which an associated file belongs, and the 'No Permit to Copy File' bit is used for determining whether to allow an associated file to be copied.

**[029]** FIGS. 5A and 5B are flow diagrams of a file management method for a recorded digital stream according to an embodiment of the present invention. The flow diagrams of FIGS. 5A and 5B can be conducted by an optical disk device configured as FIG. 2.

**[030]** Referring to FIGS. 5A and 5B, the VDR unit 3 sets an interlinking operation mode (S10) in which a file operation requested from a PC is acceptable if it is detected that the disk device has been connected with the PC through a digital interface. In this mode, if the PC requests a list of files under a certain directory recorded on the rewritable DVD 1 installed in the disk device (S11), the VDR unit 3 reads FIDs associated with files under the directory, and sends file names written in every fields of 'Name of File Identifier' to the PC

(S12).

**[031]** Accordingly, the PC displays the received file names onto its monitor, and a user may enter a command to rename, move, or copy a certain file after he or she looks into the displayed files and their directory. If a user enters such a command, the PC transmits the entered command to the disk device through a digital interface together with file identifying information (S13).

**[032]** Then, the VDR unit 3 of the disk device checks what the received command is. If the received command accompanying the file identifying information is for renaming a file (S14), the VDR unit 3 searches for the associated FID based on the file identifying information and checks the sixth bit 'No Permit to Change Name' written in the 'File Characteristics' field of the associated FID. If the sixth bit is 1 (S15) which means that the change of the filename is not permitted, the VDR unit 3 generates a message notifying that the requested file can not be renamed, and sends it to the PC (S17) through the digital interface. Otherwise, the renaming of the file is permitted and conducted (S16).

**[033]** If the received command is for moving a file (S18), the VDR unit 3 searches for the associated FID and checks the seventh bit 'No Permit to Move File' written in the 'File Characteristics' field of the associated FID. If the seventh bit is 1 (S19) which means that file moving is not permitted, the VDR unit 3 generates a message notifying that the requested file can not be moved to another directory, and sends it to the PC (S21). Otherwise, the moving of the file to another directory is permitted and conducted (S26).

**[034]** In addition, if the received command is for copying a file (S22), the VDR unit 3 searches for the



associated FID and checks the last bit 'No Permit to Copy File' written in the 'File Characteristics' field of the associated FID. If the last bit is 1 (S23) which means that file copying is not permitted, the VDR unit 3 generates a message notifying that the requested file can not be copied, and sends it to the PC (S25). Otherwise, the file copying is permitted and conducted (S24).

**[035]** According to the above-explained operation, file renaming, file moving, or file copying is prohibited for files recorded on a rewritable disk, a user who requested a file operation becomes aware that the file operation requested for the files recorded on the rewritable disk has been prohibited through a corresponding message displayed on the monitor.

**[036]** The digital stream file management method explained herein prevents disk reproduction failure caused by a file or directory change of files containing the A/V digital data stream as well as copyright infringement caused by copying the digital stream files recorded on a rewritable disk.

**[037]** Although the preferred embodiments of the present invention have been disclosed for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as recited in the accompanying claims.